

A Study on the single crystal growth of the optic-grade LiTaO₃ as a
electro-optic materials

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The single crystal of LiTaO₃ is well known eletro-optic material as well as the piezoelectric one applied to SAW filter. LiTaO₃ has large electro-optic effects, so applied to optical switch, acosto-optic deflector, and optical memory device using photorefractive effects. The crystal growth of SAW-grade LiTaO₃ has been studied many aspects, but there is no detail research about optic-grade crystal growth. The conditions of optic-grade LiTaO₃ single crystal are as below. The optical transmittance must be over 75%, and axial and radial concentratiom uniformity below 1%. The variation of Curie temperature depending on Li/Ta ratio must be also below 2°C and no internal cracks and defects. Because of the limitation of crystal quality, the growing of optic-grade LiTaO₃ single crystal is very difficult compared with the growing of SAW-grade. In this research, upper conditions of optic-grade single crystal was investigated after growing of 1 inch diameter and 1.5 inch length LiTaO₃ single crystal having no internal cracks and defects using Czochralski method. Curie temperature was determined with DSC and measuring capacitance and lattice parameter was calculated about the grown crystal and ceramic powder samples of various Li/Ta ratio. The result of T_c variation was below 1.2°C all over the grown crystal, so it is confirmed that LiTaO₃ was grown under congruent melting composition having optical homogeniety. Also, the optical transmittance was about 78%, which was sufficient for optical device.

key word : optic-grade LiTaO₃ single crystal, Czochralski method,
Curie temperature, optical transmittance